

LEGION[◇] Total Knee System: what does the evidence say for LEGION primary total knee arthroplasty (TKA)?

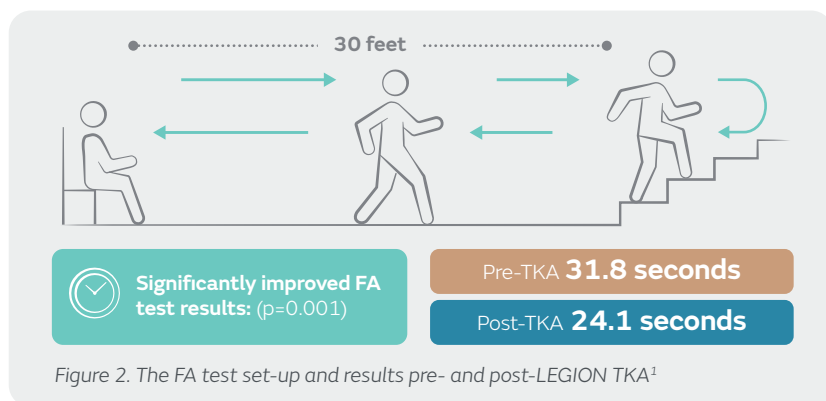
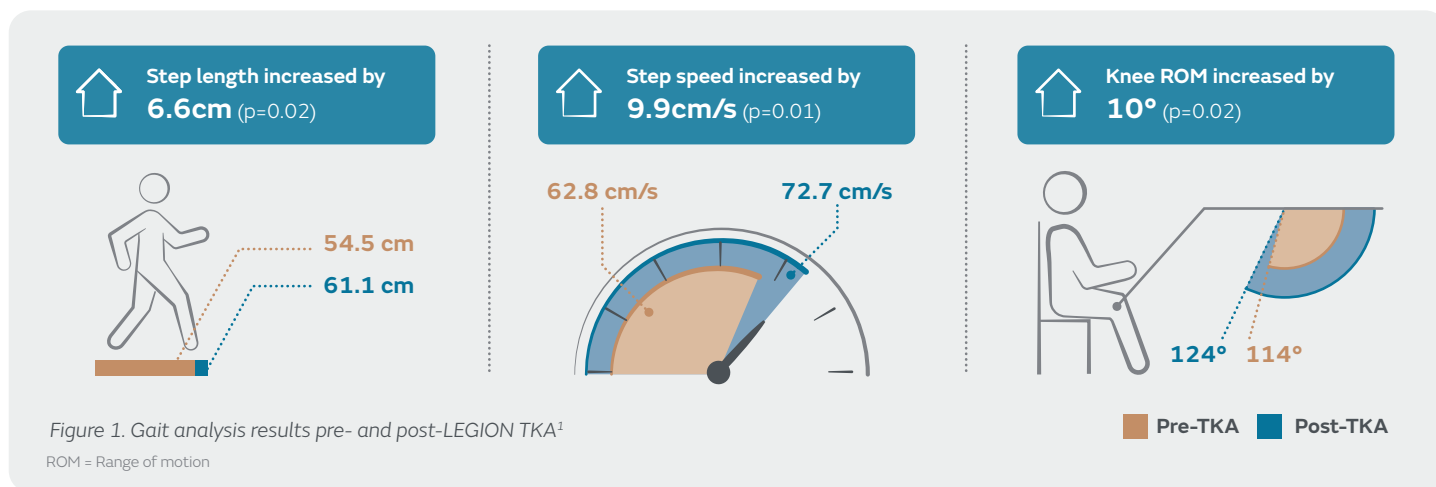
Summary

- LEGION TKA leads to improvements in knee function, similar to that of the contralateral knee¹ and with knee flexion characteristic of healthy knees,² compared to pre-TKA¹⁻⁸
- Improvements in patient satisfaction for LEGION cruciate retaining (CR) and posterior stabilised (PS) TKA compared to pre-TKA,⁸⁻¹⁰ with the majority of patients reporting being satisfied or very satisfied⁸
- Consistently high survivorship of LEGION TKA in international registries and clinical studies, with an excellent ODEP rating at 7 years^{4,5,8,11-14}

A systematic literature review, conducted in October 2020, identified 59 peer-reviewed publications containing LEGION CR, PS or revision-specific data, 16 of which were clinical studies relating to LEGION CR and PS TKA,¹⁵ in addition to an abstract presented at the European Knee Society (EKS) Arthroplasty Conference in 2019.⁵

Functional outcomes following LEGION TKA

Following TKA, over 50% of patients report some degree of limitation to their functional ability,¹⁶ hence knee function is an important measure of the success of TKA. In a study investigating functional improvement following LEGION CR TKA, over 80% of implants were reported to perform as well as or better than the contralateral knee in several functional activities, with knee function becoming more symmetrical over time.¹ In addition, there were significant increases in step length ($p=0.02$), speed ($p=0.01$) and knee range of motion (ROM) ($p=0.02$) compared to pre-TKA (Figure 1).¹



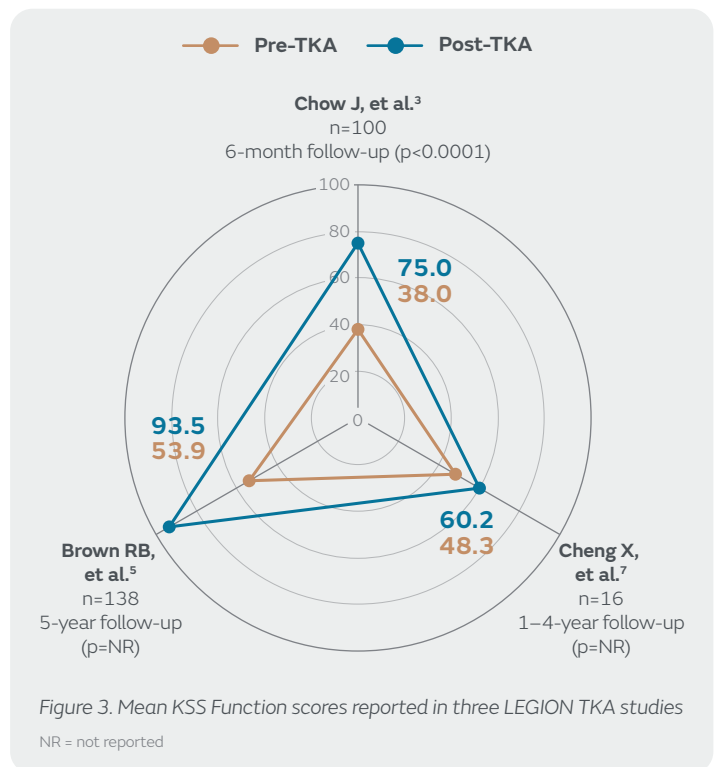
Parks NL, et al. also reported Functional Assessment (FA) test results for LEGION CR TKA patients.¹ In the FA test, which assesses movements that are challenging for these patients, the time it takes to rise from a chair, walk 30 feet, climb four stairs, turn around, descend four stairs, walk 30 feet back to the chair and sit down is recorded (Figure 2).¹ The study reported significant reductions in FA test time in patients 2 years post-LEGION CR TKA, compared to pre-TKA (8 second improvement; $p=0.001$; Figure 2).¹

+ Evidence in focus

Hyodo K, et al. analysed the gait of LEGION^o TKA patients 6 months post-operatively by investigating kinetics and muscle activation around the knee. Ten of twelve patients (83%) demonstrated physiological double knee flexion peaks during the gait cycle, characteristic of healthy knees and a normal gait.²

A number of patient-reported outcome measures (PROMS) have been used to assess pain levels and functional outcomes following LEGION TKA. In a study of 16 patients using a novel technique to tighten the medial collateral ligament, pain relief and improved knee function were reported by patients, comparing pre-TKA to after LEGION PS TKA (Visual Analogue Scale [VAS] ambulation score, 5.4 vs 1.5; Hospital for Special Surgery [HSS] score, 44.3 vs 87.1).⁷

Significant improvements in Oxford Knee Score (OKS) were reported in three studies, at 2 years ($p < 0.001$)^{1,4} and 4.6 years follow-up ($p < 0.001$).⁸ Improvements in Knee Society Scores (KSS), compared to pre-TKA, were observed in three studies for LEGION TKA at 1 year,⁶ 2 years ($p < 0.001$),¹ and 5 years⁵ post-TKA. In addition, three studies reported numerical improvements in KSS Function scores with LEGION TKA, compared to pre-TKA (Figure 3),^{3,5,7} with one study demonstrating a significant mean improvement of 36 points at 6 months post-TKA ($p < 0.0001$).³



88% of patients reported being **satisfied or very satisfied** post-LEGION TKA⁸



Figure 4. Percentage of LEGION TKA patients (n=133) who reported being satisfied or very satisfied at a mean follow-up of 4.6 months⁸

Patient satisfaction following LEGION TKA

Up to one in five patients report feeling unsatisfied with their TKA procedure.¹⁷ Improving patient satisfaction is not only important for quality of care but also for payers and healthcare providers.^{18,19}

A consecutive cohort study investigating OKS and patient satisfaction found that 88% of LEGION TKA patients (n=133) reported feeling satisfied or very satisfied after a mean follow-up of 4.6 years (Figure 4).⁸

It is recognised that Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores directly correlate to patient satisfaction, with scores of > 70 signifying excellent patient satisfaction.²⁰ Two clinical studies reported improvements in WOMAC scores with LEGION PS TKA.^{9,10} Anwar R, et al. investigated the use of patient-specific guides with LEGION PS TKA in obese patients ($\text{BMI} > 30 \text{ kg/m}^2$),¹⁰ a challenging demographic often associated with poor TKA outcomes.^{10,21} The authors reported an improvement in WOMAC scores from 38.4 to 78.6 at 1 year post-LEGION PS TKA in this high-risk group (Figure 5).¹⁰ This was in addition to improvements in Knee Injury and Osteoarthritis Outcome Score (KOOS; from 36.6 to 76.2).¹⁰ Significant improvements in WOMAC scores, KOOS categories scores and Kujala scores were also observed by Gharaibeh MA, et al. in a study of 100 LEGION PS TKA patients ($p < 0.01$).⁹

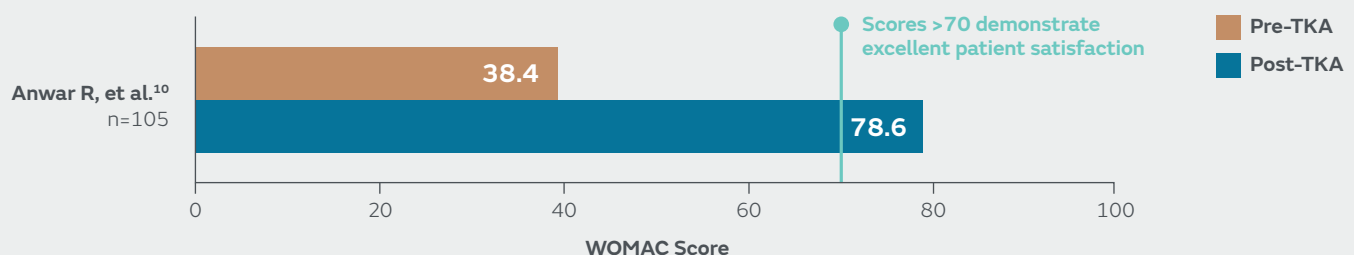


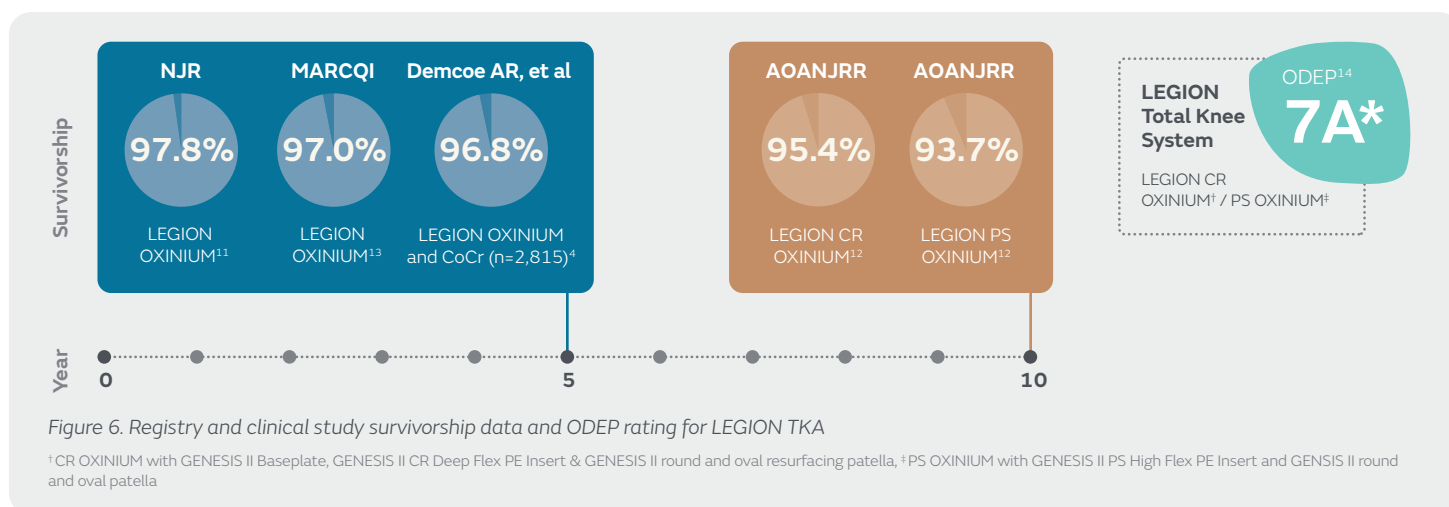
Figure 5. Mean WOMAC scores at 1 year post-LEGION PS TKA in high-risk, obese patients

+ Evidence in focus

Registry and clinical study survivorship of LEGION^o TKA

National joint registries provide insights into the real-time performance of specific implants.²² LEGION CR and PS TKA demonstrate consistently high survivorship in international registries, including the National Joint Registry of England, Wales, Northern Ireland, the Isle of Man and the States of Guernsey (NJR),* Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR) and Michigan Arthroplasty Registry Collaborative Quality Initiative (MARCQI; Figure 6).^{11–13} These registry data are supported by an excellent ODEP rating for LEGION OXINIUM^o (Figure 6).¹⁴

The registry survivorship rates for LEGION TKA are also reflected in clinical studies. A multi-centre study of 138 TKAs demonstrated 98.5% survivorship for LEGION OXINIUM TKA at 5 years.⁵ Only two minor revisions requiring the exchange of the tibial insert or patella component were performed in this study. Similar survivorship was reported by Stockwell KN, et al. in a single-centre database analysis comprising 136 TKAs, which found 98.1% survivorship for LEGION PS TKA at 5 years.⁸ Further confirmation of excellent mid-term survivorship has been demonstrated by a retrospective study of 2,815 LEGION TKAs (OXINIUM and cobalt chrome).⁴ Demcoe AR, et al. reported LEGION TKA survivorship rates of 98.2% at 2 years and 96.8% at 5 years (Figure 6).⁴ Given the shared design features of GENESIS^o II and LEGION TKA, and the consistently high mid-term performance of the latter, LEGION TKA may demonstrate a similar long-term survivorship to its predecessor of more than 96% at 10 years.²³



Conclusion

LEGION TKA has evolved from the GENESIS II system, which has more than 20 years of clinical data demonstrating its safety and efficacy plus a high survivorship rate.²³ Consistent with its predecessor, LEGION CR and PS TKA demonstrate consistently high survivorship in international registries and clinical studies.^{4,5,8,11–13} LEGION TKA has also been shown to result in improved patient satisfaction^{8–10} and knee function^{1–8} compared to pre-TKA.

*We thank the patients and staff of all the hospitals in England, Wales and Northern Ireland who have contributed data to the National Joint Registry. We are grateful to the Healthcare Quality Improvement Partnership (HQIP), the NJR Steering Committee and staff at the NJR Centre for facilitating this work. The views expressed represent those of the authors and do not necessarily reflect those of the National Joint Registry Steering Committee or the Health Quality Improvement Partnership (HQIP) who do not vouch for how the information is presented.

References

1. Parks NL, Whitney CE, Engh GA. Can we quantify functional improvement following total knee arthroplasty in the clinical setting? *J Knee Surg.* 2015;28:475–82.
2. Hyodo K, Kanamori A, Kadone H, et al. Gait analysis comparing kinematic, kinetic, and muscle activation data of modern and conventional total knee arthroplasty. *Arthroplast Today.* 2020;6:338–342.
3. Chow J. Wireless microcurrent-generating antimicrobial wound dressing in primary total knee arthroplasty: a single-center experience. *Orthop Rev (Pavia).* 2016;8:6296.
4. Demcoe AR, Bohm ER, Hedden DR, et al. Does oxidized zirconium make a difference? Midterm cohort survivorship of symmetric posterior condyle posterior-stabilized total knee arthroplasty. *Can J Surg.* 2019;62:118–122.
5. Brown R, Harwood D, Mahoney C, et al. Midterm outcomes of an oxidised zirconium femoral component for total knee replacement. Abstract number P17. In European Knee Society, Valencia, Spain. 2–3 May, 2019.
6. Nodzo SR, Carroll KM, Mayman DJ. The bicruciate substituting knee design and initial experience. *Tech Orthop.* 2018;33:37–41.
7. Cheng X, Wang Z, Zhang Y, et al. Tightening medial collateral ligament during total knee arthroplasty for patients with fixed valgus deformity: A novel technique. *J Orthop Surg (Hong Kong).* 2019;27:2309499019834695.
8. Stockwell KD, Gascoyne TC, Singh M, et al. Survivorship of constrained polyethylene inserts in primary total knee replacements. *Knee.* 2020;27:1343–1348.
9. Gharraibeh MA, Monk E, Chen DB, et al. Evaluation of the patellofemoral joint in total knee arthroplasty: validation of the weight bearing merchant radiographic view. *Knee.* 2018;25:1262–1271.
10. Anwar R, Kini SG, Sait S, et al. Early clinical and radiological results of total knee arthroplasty using patient-specific guides in obese patients. *Arch Orthop Trauma Surg.* 2016;136:265–70.
11. NJR. National Joint Registry for England, Wales and Northern Ireland. 17th Annual Report. 2020.
12. AOANJRR. Australian Orthopaedic Association National Joint Replacement Registry: Hip, Knee & Shoulder Arthroplasty. Annual Report. 2020.
13. MARCQI. Michigan Arthroplasty Registry Collaborative Quality Initiative. Annual Report. 2019.
14. ODEP Orthopaedic Data Evaluation Panel. Available at <http://www.odep.org.uk>. Accessed 09 February 2021.
15. Smith+Nephew 2020. Systematic literature review of evidence for LEGION. Clinical and Medical Affairs Evidence Analysis Report: EA/RECON/LEGION/002/v3.
16. Noble PC, Gordon MJ, Weiss JM, et al. Does total knee replacement restore normal knee function? *Clin Orthop Relat Res.* 2005;431:157–165.
17. Scott CE, Oliver WM, MacDonald D, et al. Predicting dissatisfaction following total knee arthroplasty in patients under 55 years of age. *Bone Joint J.* 2016;98-b:1625–1634.
18. Lyu H, Wick EC, Housman M, et al. Patient Satisfaction as a Possible Indicator of Quality Surgical Care. *JAMA Surg.* 2013;148:362–367.
19. Otani K, Waterman B, Faulkner KM, et al. Patient satisfaction: focusing on “excellent”. *J Healthc Manag.* 2009;54:93–102; discussion 102–3.
20. Walker LC, Clement ND, Bardgett M, et al. The WOMAC score can be reliably used to classify patient satisfaction after total knee arthroplasty. *Knee Surg Sports Traumatol Arthrosc.* 2018;26:3333–3341.
21. Boyce L, Prasad A, Barrett M, et al. The outcomes of total knee arthroplasty in morbidly obese patients: a systematic review of the literature. *Arch Orthop Trauma Surg.* 2019;139:553–560.
22. Berry DJ. Joint registries: what can we learn in 2016? *Bone Joint J.* 2017;99-b:3–7.
23. Smith+Nephew 2011. The GENESIS II total knee system in primary total knee arthroplasty: a systematic literature review of clinical outcomes. Internal report, literature number: 71281870 REV0 7/11. Available at: https://www.smith-nephew.com/documents/nl-genesisii-clinical_evidence-review_clinical_outcomes.pdf.